



ID de Contribution: 2

Type: Oral presentation

## An experimental simulation of the atmosphere of the temperate exoplanet K2-18b

*vendredi 1 mars 2024 10:15 (15 minutes)*

Observations made in recent years by the Kepler, Hubble, Spitzer and James Webb space telescopes have revealed the presence of an atmosphere around the temperate exoplanet K2-18b. According to the latest JWST observations, this H<sub>2</sub>-rich atmosphere contains significant proportions of carbon-bearing molecules such as CO<sub>2</sub> and CH<sub>4</sub>. The detection of such molecules is extremely interesting in the context of astrobiology; indeed, we can imagine the formation of more complex organic molecules through photochemical reactions in the upper atmosphere. These potential photochemical products would be present in small proportions, not necessarily detectable in observations.

To investigate the possibility of forming longer carbon chains through photochemical reactions in an atmosphere like that of K2-18b, it is necessary to rely on laboratory experiments. A gaseous mixture, analogous to K2-18b's atmosphere, is produced in a cold AC plasma reactor (PAMPRE) and subjected to a plasma simulating the energetic radiation to which the exoplanet's upper atmosphere may be exposed. The reactions taking place in the chamber are monitored by mass spectrometry, enabling us to identify the chemical evolution of the gas mixture.

The results indicate the production of carbon monoxide, water vapor and some organics, which would therefore be minor components of K2-18b's atmosphere. We have also highlighted that methane cannot be a simple product of CO<sub>2</sub> dissociation, implying another source of CH<sub>4</sub> to explain the observations.

### Astrophysics Field

Planetology (including small bodies and exoplanets)

### Day constraints

**Auteur principal:** SOHIER, Oriane (LATMOS)

**Orateur:** SOHIER, Oriane (LATMOS)

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